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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/757,387

01/15/2004

Kazuyuki Ono

00862.023412

4951

5514 7590 07/20/2007
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EXAMINER

MASKELL, MICHAEL P

ART UNIT

PAPER NUMBER

2809

MAIL DATE

DELIVERY MODE

07/20/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/757,387

Applicant(s)

ONO, KAZUYUKI

Examiner

Michael Maskell

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 15 January 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) 14 and 15 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-10 and 13 is/are rejected.
- 7) ☒ Claim(s) 11 and 12 is/are objected to.
- 8) ☒ Claim(s) 14 and 15 are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 15 January 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 01/15/04, 02/20/04.
- 4) ☒ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application
- 6) ☒ Other: Email Election/Restriction.

DETAILED ACTION

Election/Restrictions

1. In an email correspondence with Steven Warner dated 26 April 2007 and attached to this office action, Mr. Warner stated applicant's desire to elect, with traverse, the invention of claims 1-13 in response to examiner's restriction requirement. Acknowledgement of this election must be made in applicant's reply. Claims 14 and 15 withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected exposure apparatus and manufacturing method, there being no allowable generic or linking claim.

Drawings

2. Figure 6 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

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4. Claims 2 and 3 rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 2 recites the limitation "said reticle stage" in line 10, while claim 3 recites the same limitation in line 13. There is insufficient antecedent basis for this limitation in the claims. Claim 1 does not contain reference to a "reticle stage," but rather a "master stage." Identical terminology should be used when importing limitations into a dependent claim in order to avoid indefiniteness.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 1 and 2 rejected under 35 U.S.C. 102(b) as being anticipated by Nobushige (Japanese Patent JP10012539). Nobushige discloses a movable stage apparatus comprising a master stage on which a reflecting master is to be mounted (3 in Fig. 1), wherein when a space is divided by a plane including a reflection surface of the master, a guide surface (2 in Fig. 1) to guide movement of the master stage is arranged in a space opposite to a space where an exposure light beam to be reflected by the master passes; wherein said reticle stage is movably supported in noncontact with a base of the movable stage apparatus (4-7 in Fig. 1).

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 3-5, 7 and 8 rejected under 35 U.S.C. 103(a) as being unpatentable over Nobushige in view of Kim, et al. ("High-precision magnetic levitation stage for photolithography," *Precision Engineering*, 22:66-77, 1998). Nobushige discloses the apparatus of claim 1, where the reticle stage comprises a coarse movement stage which reciprocally moves on the guide surface formed on a base of the movable stage apparatus in a scanning direction along said guide surface in noncontact with said guide surface, wherein a driving point of said coarse movement stage is arranged between the reflection surface of the reticle and said guide surface(6,7 in Fig 1) as in claim 4, wherein a thrust generating mechanism for said coarse movement stage includes a plurality of linear motors arranged parallel to the scanning direction (4-7 in Fig. 1) as in claim 5; but fails to teach a fine movement stage arranged on said coarse movement stage and having a 6-axis alignment mechanism as present in base claim 3.

However, Kim teaches a fine movement stage having a 6-axis alignment mechanism (Abstract and Fig. 1) for use in a photolithography system. This alignment mechanism consists of an electromagnet in non-contact with said fine movement stage, which, when added to the coarse movement stage would transmit a force generated upon acceleration or deceleration of said coarse movement stage as in claim 8. Kim

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further details the advantages of implementing such a fine-control system in a photolithography apparatus.

Regarding claim 7, the driving points of the linear motors coinciding with the barycenters of the stators at least in the directions of non-motion and of gravity is an inherent limitation of the arrangement disclosed by Nobushige as applied to claim 3. Since the driving points of the linear motors are one magnet and the stators are a magnet of opposite polarity (both top and bottom halves of the stators being composed of the same magnet), the driving points of the linear motors would necessarily be levitated to the midpoint between the upper and lower halves of the stators.

It would therefore have been obvious to one of ordinary skill in the art at the time of the invention to modify the teachings of Nobushige with those of Kim to provide a 6-axis fine movement stage arranged on said coarse movement stage. Doing so would provide the ability to manufacture devices with high precision, no obstruction of the area through which the beam passes, and little heat generation.

9. Claims 6 and 13 rejected under 35 U.S.C. 103(a) as being unpatentable over Nobushige in view of Kim as applied to claim 5 above, and further in view of Takahashi, et al. (EP 1143492 A1).

Regarding claim 6, Nobushige teaches the apparatus of claim 5, but fails to teach wherein the stators of said linear motors are movably supported in noncontact with said base, and comprise counter masses which move in a direction opposite to a driving direction of said coarse movement stage due to a moving reaction force of said coarse movement stage.

However, Takahashi teaches a movable stage apparatus for a reticle stage, in which the coarse movement stage and the stators of the linear motors move in opposite directions so that momentum is conserved and vibration is suppressed.

It would therefore have been obvious to one of ordinary skill in the art at the time of the invention to combine the teachings of Nobushige as applied to claim 5 above with those of Takahashi to provide the apparatus according to claim 5, wherein the stators of said linear motors are movably supported in noncontact with said base, and comprise counter masses which move in a direction opposite to a driving direction of said coarse movement stage due to a moving reaction force of said coarse movement stage. Doing so would aid in suppressing vibration.

Regarding claim 13, Nobushige as applied to claim 3 teaches the apparatus of claim 3, but fails to teach wherein an interferometer to measure rolling, pitching, and a z-axis position as a vertical direction of said fine movement stage, an interferometer to measure yawing and a y-axis position perpendicular to the vertical direction, and an interferometer to measure an x-axis position perpendicular to y and z axes are mounted on a top plate of said fine movement stage, and a long mirror to measure the z-axis position, rolling, and pitching, a short mirror to measure the y-axis position and yawing, and a long mirror to measure the x-axis position are mounted on a base which supports a projection optical system and which is vibration-insulated from a base that supports said reticle stage.

However, Takahashi teaches a stage apparatus that includes three interferometers to measure rolling, pitching, a z-axis position, yawing, a y-axis position,

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and an x-axis position, the three interferometers being mounted on a base that is isolated from vibration. (Column 8, lines 15-50)

It would therefore have been obvious to one of ordinary skill in the art at the time of the invention to combine the teachings of Nobushige as applied to claim 3 with those of Takahashi to provide the apparatus of claim 3, wherein an interferometer to measure rolling, pitching, and a z-axis position as a vertical direction of said fine movement stage, an interferometer to measure yawing and a y-axis position perpendicular to the vertical direction, and an interferometer to measure an x-axis position perpendicular to y and z axes are mounted on a top plate of said fine movement stage, and a long mirror to measure the z-axis position, rolling, and pitching, a short mirror to measure the y-axis position and yawing, and a long mirror to measure the x-axis position are mounted on a base which supports a projection optical system and which is vibration-insulated from a base that supports said reticle stage. Doing so would allow precise measurement and control of the stage's position.

10. Claims 9 and 10 rejected under 35 U.S.C. 103(a) as being unpatentable over Nobushige in view of Kim as applied to claim 3 above, and further in view of Poon, et al (U.S. Patent 6,281,655). Nobushige teaches the apparatus of claim 3, but fails to teach wherein the reflection surface of the reticle is arranged to face vertically downward, and said fine movement stage is supported in noncontact with said coarse movement stage and is positioned in 6-axis directions by a 6-axis alignment mechanism which can

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perform position control of said coarse movement stage in 6-axis alignments, and by a self weight support mechanism which supports a weight of said fine movement stage.

However, Poon teaches a stage assembly with a coarse stage and a fine stage, both of which are not constrained along the x, y, and z axes, and therefore are capable of being positioned in 6-axis directions by the alignment mechanism which performs position control of the coarse movement stage (Column 2, lines 38-47); and a self weight support mechanism which supports a weight of said fine movement stage (Column 2, lines 48-53).

Further, regarding claim 10, this self weight support mechanism pushes the fine movement stage towards the coarse movement stage with a magnetic force (Column 7, lines 49-67).

It would therefore have been obvious to one of ordinary skill in the art at the time of the invention to combine the teachings of Nobushige as applied to claim 3 above with those of Poon to provide the apparatus of claim 3, wherein the reflection surface of the reticle is arranged to face vertically downward, and said fine movement stage is supported in noncontact with said coarse movement stage and is positioned in 6-axis directions by a 6-axis alignment mechanism which can perform position control of said coarse movement stage in 6-axis alignments, and by a self weight support mechanism which supports a weight of said fine movement stage, and wherein said self weight support mechanism so supports a weight of said fine movement stage as to push up said fine movement stage toward said coarse movement stage with a magnetic force.

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Doing so would allow coarse movement of the fine movement stage via a non-contact magnetic means that eliminates mechanical vibration.

Allowable Subject Matter

11. Claims 11 and 12 objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael Maskell whose telephone number is 571/274-3210. The examiner can normally be reached on Monday-Friday 8AM-5PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Terrell McKinnon can be reached on 571/272-4797. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Michael Maskell
08 May 2007



TERRELL L. MCKINNON
SUPERVISORY PATENT EXAMINER